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AUTHOR Slater, Wayne H.; And Others
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ABSTRACT

After 104 high and low ability ninth grade students read prose passages, they wrote all that they remembered about the passage, exhibiting how text features affected text recall. The materials varied in length, the number of propositions presented, and whether headings were used to organize the passage. Only one of the two sets of directions used for the task explained the organization of the passage. The high ability students recalled more propositions than low ability students. Students receiving directions with signaling recalled more propositions than those receiving directions without signaling. Although low ability students generally recalled less than high ability students, the low ability students who received the elaborated version of the prose passage along with directions explaining passage organization demonstrated recall approaching that of the high ability students. Significantly more high ability students used the author's schema. Students used the author's schema significantly more frequently when they were given the directions explaining text organization. The use of elaboration (more propositions/longer passage) did not significantly affect amount of recall. Overall, the results failed to indicate that major textual changes had any significant effect on student recall. (RL)

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Effects of Directions Describing Passage Structure, Signaling, and Elaboration of Readers' Recall

Wayne H. Slater, Rebecca J. Palmer, and Michael F. Graves

University of Minnesota

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Wayne H. Slater, Rebecca J. Palmer, and Michael F. Graves

University of Minnesota

Current work in the development of textual grammars and in discourse analysis employing textual grammars (Fredericksen, 1975; Grimes, 1975; Kintsch, 1974; Meyer, 1975; Turner & Greene, 1977) is of course of interest to various groups--linguists, psychologists, educators concerned with first and second language acquisition, and educators concerned with the teaching of reading. Such work is of particular interest to reading educators concerned with the teaching of adolescents both because youngsters of this age have largely mastered language at the level of the sentence and because these youngsters are increasingly faced with the task of learning from written discourse. There are, of course, a myriad of questions that educators concerned with students' learning from text might ask. One of the most obvious questions, and the one of concern in the present study, is that of what features of text facilitate adolescents' remembering what they read. More specifically, the present study investigates the effects of three features of texts--elaboration, signaling, and explicit directions describing the passage structure--on ninth grade students' written recall of an expository passage.

One line of research motivating the present study is that on

elaboration. As defined by Craik and Tulving (1975), elaboration is the process of adding specific concrete information to simple sentence frames. Thus the sentence, "The great bird swooped down and carried off the struggling puppy," is more elaborated than the sentence, "The bird carried off the puppy." In a series of experiments, Craik and Tulving (1975) demonstrated that more elaborated sentences resulted in "more elaborate encoding and superior memory performance" (p. 284) as measured by both free recall and cued recall tasks. Among the other factors that Craik and Tulving suggest influenced subjects' recall in these experiments were the amount of material presented and the time spent studying this material. One assumption underlying the present study was that elaboration involving units larger than the sentence would similarly result in more material presented and more time spent studying the material and consequently in improved recall.

A second line of research motivating the present study is that which has investigated the relationship between readers' recognition of the organization of a passage and their recall of information from that passage. In one study in this area, Meyer, Brandt, and Bluth (1978) examined the extent to which good and poor ninth grade readers used the authors' organization in writing recall protocols immediately after reading short texts. Results indicated that most good readers used the same organization as the authors of the text in their protocols while most poor readers did not. Results further indicated that students who used the same organization as the authors of the text recalled significantly more information than those who did not. In a recent replication of the Meyer et al. study, Palmer, Slater, and Graves (1979) again found that good readers use the

author's organization in writing recall protocols much more often than poor readers, and that readers who use the author's organization recall much more than those who do not, in this case nearly twice as many propositions. A second assumption underlying the present study was that directly explaining the organization of a passage to students before they read it would facilitate their recognizing that organization and recalling the passage.

The third line of research motivating the present study is that which has investigated the relationship between signaling and subjects' recall of information from prose passages. Signaling is described by Meyer (1975) as the use of headings, side headings, or phrases embedded in the text which highlight specific ideas or aspects of the organization of the text. For example, in a passage organized with a response rhetorical predicate (a type of organization in which the author first presents a problem and then presents the solution to the problem), the author might focus the reader on the top-level structure with signaling by the explicit use of the labels problem and solution. Meyer (1975) hypothesized that passages employing signaling would produce greater written recall of the passage content than passages which did not employ signaling. In general, results of Meyer's study, which used Cornell University students as subjects, indicated that the influence of signaling on recall was small and did not produce statistically significant differences. However, most comparisons of passages with and without signaling showed that the signaled versions of the passages produced better recall than the non-signaled versions. In a replication of Meyer's study using junior college students as subjects, Marshall (1976)

found larger and statistically significant differences indicating that signaling did aid written recall. And in a later study, Meyer, Brandt, and Bluth (1978) found some indications that signaling aided the recall of poorer ninth grade readers but not of better ninth grade readers. In summary, there is some evidence that signaling aids recall, at least with less able students. The third assumption underlying the present study was, thus, that signaling may aid written recall.

Based on these three assumptions--that elaboration, directions explaining the organization of a passage, and signaling would facilitate written recall--two hypotheses were formulated. The first was that elaboration would facilitate recall. The second was that a combination of directions explaining the organization of a passage and signaling would facilitate recall. The decision to combine signaling with directions explaining the organization of the passage was made because the effect of signaling by itself had been shown to be small and the results were inconsistent.

Method

Subjects

Subjects for the study were 104 ninth graders enrolled in a four year Catholic high school in a middle-class suburb of Minneapolis. Approximately half of the subjects were designated by the school as high ability students and half were designated as low ability students on the basis of test scores, grades, and teachers' rankings. However, discussions with the school staff revealed that the school enrolled largely average and above average students. Thus, most of the

students in what is called the low ability group were of average ability.

Materials

Materials consisted of four versions of a prose passage on supertankers and two sets of directions.

Version One of the passage was titled "The Problem with Supertankers and Its Solution" and included two side headings which clearly identified the organization of the passage. The first of these side headings was "The Problem," and the second of them was "The Solution." Version One also included a number of specific details which directly supported the major ideas presented in the passage. It was 274 words long, contained 96 propositions, and was rated as being at the seventh-eighth grade level by the Dale-Chall formula (1948). The complete text of Version One is shown in Figure 1 below. Version Two of the passage had the same title

Insert Figure 1 about here

and subheadings as Version One. However, it differed from Version One in that it did not include specific details supporting the major ideas. It was 121 words long, less than half as long as Version One, and contained 61 propositions. It also was rated as being at the seventh--eighth grade level by the Dale-Chall formula (1948). The complete text of Version Two is shown in Figure 2 below. Version Three of the passage

Insert Figure 2 about here

was simply titled "Supertankers" and had no subheadings; otherwise, it

was the same as Version One. Version Four of the passage was also simply titled "Supertankers" and had no subheadings; otherwise, it was the same as Version Two.

As noted above, the materials included two sets of directions. One set of directions explained that there are a number of ways of organizing writing, that the passage to be read was organized in a manner in which a problem was first presented and then a solution to the problem was presented, and that students should identify the problem and solution as they read the passage. It also noted that students were to write down all they remembered from the passage immediately after reading it. The other set of directions simply noted that students were to write down all they remembered from the passage immediately after reading it.

In all cases, the detailed directions were combined with the versions of the passages which included signaling. Thus, students got one of four sets of materials: (1) a set that included detailed directions coupled with signaling and the elaborated version of the passage, (2) a set that included detailed directions coupled with signaling and the unelaborated version of the passage, (3) a set that included brief directions without signaling and the elaborated version of the passage, and (4) a set that included brief directions without signaling and the unelaborated version of the passage.

Design and Analysis

The study employed three independent variables, each of which had two levels, and two dependent measures. The independent variables were ability (high, low), elaboration (elaborated, unelaborated), and

directions and signaling (present, absent). (Again, it should be noted that directions and signaling functioned as a single variable; a subject received both detailed directions and a passage with signaling or neither detailed directions nor a passage with signaling.) The dependent measures were the number of propositions subjects recalled and a score indicating the extent to which subjects followed the author's organization. Propositions were tallied using Meyer's (1975) system of text analysis, and the score indicating the extent to which subjects followed the author's organization was derived using the Meyer et al. (1978) procedure.

A three-way analysis of variance was used to anlyze the results with respect to the number of propositions recalled, and a series of Chi-square analyses were used to analyze the results with respect to subjects' following the author's organization.

Procedures

Subjects were tested in their classes by their classroom teachers. All treatments were administered within each of the classes tested. A test booklet containing one of the four treatments was given to each subject. Subjects were told that they were participating in a study designed to determine how students read and remember information and that they should read the directions in the packet, read the passage given, and write down all they could remember about the passage. All students were given as much time as necessary to complete the reading and write the recall protocols.

Results

Results with respect to the number of propositions recalled will be presented first. Table 1 shows the mean number of propositions recalled for each level of ability, elaboration, and directions and signaling.

Insert Table 1 about here

As can be seen from the table, high ability students recalled more propositions than low ability students, students receiving the elaborated versions of the passage recalled more propositions than those receiving the unelaborated versions, and students receiving the versions of the passage with directions and signaling recalled more propositions than those receiving the versions without directions and signaling. However, the analysis of variance indicated that only the difference due to ability was statistically significant, $F(1, 96) = 7.77$, $p<.05$, and as is obvious from the table, the difference due to directions and signaling is virtually nonexistent. Moreover, the analysis of variance further showed that none of the interactions were statistically significant. However, one of the interactions, while not statistically significant, is suggestive and perhaps worth noting. This is the ability x elaboration x directions and signaling interaction shown in Table 2 below. Inspection of the cell means indicates

Insert Table 2 about here

that while low ability students generally recalled less than high

ability students, the low ability students who received the elaborated version of the passage and directions and signaling demonstrated recall approaching that of the high ability students. More will be said about this result in the discussion.

The analyses of the extent to which subjects followed the author's organization in writing their recall protocols produced similar but not identical results. The number of subjects rated as following and not following the author's organization at each level of ability and for each condition of directions and signaling and of elaboration is shown in Table 3 below. As can be seen from the table and as is suggested by

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Insert Table 3 about here

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the Chi-square analysis, significantly more high ability students, $X^2(1) = 7.26$, $p<.01$, used the author's schema, and students used the author's schema significantly more frequently, $X^2(1) = 3.89$, $p<.05$, when given directions and signaling than when not. However, the use of elaboration did not significantly affect subjects using the author's organization in recall protocols. As was the case with respect to number of propositions recalled, the three-way interaction obtained with scores indicating use of the author's organization is worth noting. This interaction is shown in Table 4 below. Inspection of the table shows

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Insert Table 4 about here

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that relatively the same proportion of high ability students follow the author's organization regardless of whether or not the passage is

elaborated or whether or not detailed directions and signaling are used. However, the situation is quite different with low ability students. Only about half of the low ability students follow the author's organization when detailed directions are not used. But when detailed directions and signaling are used, even with the unelaborated version of the passage, over 60% of the low ability students follow the author's organization. And when detailed directions and signaling are used with the elaborated version of the passage, 80% of the low ability students follow the author's organization, this percentage being approximately equal to the percentage of high ability students that follow it. Note that this combination of treatment conditions--the elaborated version of the passage with directions and signaling--is the same combination that facilitated low ability students' recall of propositions.

Discussion

Certainly, results obtained from one experiment with approximately 100 students from a single school and using a single passage can only be suggestive. Nevertheless, we believe that the results of the study are interesting and that the suggestions that arise from the results are worth considering. The major result of the study is a negative one. Specifically, major textual changes failed to have much effect on the majority of the students who participated. Doubling the number of words in the passage and increasing the number of propositions by 50% failed to have a significant effect on the number of propositions recalled. To be precise, doubling the number of words in the passage and

increasing the number of propositions it contained by 50% resulted in only about 10% more propositions being recalled. Moreover, this increase in number of words and propositions had virtually no effect on whether or not most students followed the author's organization in their protocols.

Similarly, the use of directions and signaling to highlight the organization of the passage generally had relatively little effect. It increased the number of propositions recalled by only 1%. And while use of directions and signaling did significantly increase the number of students who followed the author's organization in their recall protocols, it is hardly surprising that using the headings problem and solution and telling students to look for the problem and its solution as they read the passage would result in their following that organization in their written protocols. Moreover, the value of following the author's organization, when following that organization does not result in improved recall, as was generally the case in this study, is questionable.

This negative result would seem to be of concern to those looking for ways to facilitate students' learning from text. And we believe that it should be. Certainly, one hopes that students don't learn just as well from much briefer and less clearly organized material as they do from longer and more clearly organized materials. Yet that is precisely what much of the data from the present study suggests. However, we believe that there are three aspects of the present study which may explain these results and that suggest directions for further research

on learning from text.

One aspect of the study which we think needs to be changed if further research is to produce positive results is that of the amount of active student involvement the treatments required. In fact, the students' roles in the study were totally passive with the exception of writing the recall protocols. We will certainly design future treatments so that students are forced to be more reactive. Note, however, that most current texts make no more demand for students' active involvement than did our treatment.

A second aspect of the study which we think needs to be changed in at least some future studies is that the students were directed to read the passage a single time and more or less to read straight through it at their normal rate. This has been the practice in a number of studies similar to the present one, and unfortunately, frequently the practice of students when reading their school texts. Nevertheless, it is certainly not the way to study, and if the criteria measured are to be the amount remembered and the accuracy of what is remembered, students need to be told to study the text with care.

Finally, the third aspect of the study that we would question is the use of written recall as the sole dependent measure. For one thing, remembering everything, at least one task posed by recall, usually isn't the goal of reading, even of reading a textbook. For another, written recall protocols may reflect as much about how much students care to write as about how much they remember. There are other potential problems with recall, but our major point is that recall ought not to be used exclusively and that just what recall reveals, or for that

matter what many dependent measures reveal, ought to be questioned.

Having explored the implications suggested by our negative results, we turn now to consideration of the more positive results of the study--the results obtained with the low ability students who received the elaborated version of the passage along with the detailed directions and signaling. As already noted, the low ability students who received this treatment combination outperformed other low ability students and approached the performance level of high ability students on both the measures of number of propositions recalled and of following the author's organization.

We don't know why the combination of elaboration, directions, and signaling worked better with these lower ability students than with higher ability ones. Moreover, we would want to replicate these results before treating them as valid. Also, as we mentioned earlier, the "low ability" students in the present study probably would be considered average students in most schools. Nevertheless, we are encouraged by the results with these lower ability students, and we believe that we have identified some changes to our methods that can make the use of elaboration, signaling, and directions for reading more effective with all ability students.

We have repeatedly learned from our experiences working with older youngsters that influencing their learning from text is a real challenge. But we accept that challenge. And we are confident that with knowledge accumulated in your field--particularly in analyses that consider factors beyond the sentence--knowledge accumulated in the field of psychology, and the knowledge of our own field, we can meet that challenge.

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Table 1

Mean Number of Propositions Recalled for Each Condition of Ability, Elaboration, and Directions and Signaling

Ability	
High	Low
30.13	24.87

Elaboration	
Elaborated	Unelaborated
29.02	26.17

Directions and Signaling	
Present	Absent
27.88	27.53

Table 2

Mean Number of Propositions Recalled for Each Combination of Ability, Elaboration, and Directions and Signaling

	High Ability		Low Ability	
	Directions and Signaling		Directions and Signaling	
Elaboration	Present	Absent	Present	Absent
Elaborated	31.38	30.31	28.73	25.08
Unelaborated	28.00	30.92	20.37	23.00

Table 3

Number of Subjects Following and Not Following the Author's Organization for Each Condition of Ability, Directions and Signaling, and Elaboration

	Ability	
	High	Low
Followed	47	29
Did Not Follow	9	19

	Directions and Signaling	
	Present	Absent
Followed	41	35
Did Not Follow	9	19

	Elaboration	
	Elaborated	Unelaborated
Followed	41	35
Did Not Follow	15	13

Table 4

Number of Subjects Following and Not Following the Author's Organization for Each Combination of Ability, Elaboration, and Directions and Signaling

	High Ability			
	Elaboration			
	Elaborated		Unelaborated	
	Directions and Signaling		Directions and Signaling	
	Present	Absent	Present	Absent
Followed	10	13	14	10
Did Not Follow	3	3	0	3

	Low Ability			
	Elaboration			
	Elaborated		Unelaborated	
	Directions and Signaling		Directions and Signaling	
	Present	Absent	Present	Absent
Followed	12	6	5	6
Did Not Follow	3	6	3	7

Figure 1: THE PROBLEM OF SUPERTANKERS AND ITS SOLUTION

The Problem

Over the past ten years, a number of supertankers have been built and used to ship oil. Supertankers are very large and can carry much more oil than regular size ships. However, supertankers sometimes have accidents and spill their oil. Stopping oil spills from supertankers is a big problem. The usual supertanker carries a half-million tons of oil and is as long as five football fields. The oil from wrecked supertankers kills fish, birds, and plant life. A recent wreck off Alaska killed all the salmon in a 30 mile area. When a tanker sank off the coast of England, more than 200,000 seagulls died. And an oil spill off the California coast killed off all the seaweed for a period of three years. Most wrecks are caused by the lack of power and the lack of steering gear needed to handle emergencies such as storms. Most supertankers lack power because they have only one boiler to provide power and one propeller to drive them. Most supertankers lack adequate steering gear in that they have only one rudder.

The Solution

Some people have said that the solution to the problem of supertankers is to stop using them. However, this is not a good solution. We should not stop using supertankers because 80 percent of the world's oil is carried by them. Instead, the solution is to improve the training of ships' officers and build better ships. First, ships' officers must be thoroughly trained to handle the ships in emergency situations. Second, ships must be built with at least two boilers and two propellers to provide power and with two rudders to give them adequate steering capabilities.

Figure 2: THE PROBLEM OF SUPERTANKERS AND ITS SOLUTION

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